This “knowledge festival” covers fundamental tool skills in statistics. A grade of 80% or higher on two different administrations of the test is needed, in order to pass the class. (The test may be taken multiple times.) The test is open book, open notes. A calculator may (and should) be used. Make sure you show your work.

Questions on this test are worth a total of 98 points; relative problem weights are given in brackets. You also get two points for spelling your name (correctly! and legibly!) in the space below.

*Enjoy!*

“On my honor, I affirm that I have neither given nor received unauthorized assistance on this test.”

__________________________
(signature)

__________________________
(name, printed legibly)

CLASS SECTION (check one):

_____ Monday at noon
      Monday at 2:30

_____ Wednesday at noon
      Wednesday at 2:30

**QUESTION 1 [10 points]:**
For a normal distribution, approximately **95%** of the data lie within two standard deviation of the mean and approximately **all (99.7%)** of the data lie within three standard deviations of the mean.

**QUESTION 2 [2 points]:**
Indicate whether the following statement is TRUE or FALSE.

If the data are skewed right, then the mean will be less than the median. TRUE FALSE
QUESTION 3 [20 points, divided as indicated]:

Dr. Rasp randomly selects a sample of four STAT 201 students. He obtains data on how often each has fallen asleep in class, so far this semester. The data are below.

\[ 9 \quad 1 \quad 6 \quad 4 \]

[Remember to show your work on these. Even if your electronic fingers-and-toes will do all the computations, you should still demonstrate that you know what is happening inside the black box.]

a) [4] Give the sample mean for the data.

\[
\text{Mean} = \frac{9 + 1 + 6 + 4}{4} = \frac{20}{4} = 5
\]

b) [4] Find the sample median for the data.

\[
\text{Median} = 1 \quad 4 \quad 6 \quad 9 \quad \rightarrow \quad 6
\]

c) [8] Find the sample variance for the data.

\[
\text{Variance} = \frac{(9-5)^2 + (1-5)^2 + (6-5)^2 + (4-5)^2}{4-1}
\]

\[
= \frac{(4)^2 + (-4)^2 + 1^2 + (-1)^2}{3}
\]

\[
= \frac{3y}{3} = \frac{11 + \frac{1}{3}}{3}
\]

d) [4] Find the sample standard deviation for the data.

\[
\text{ST DEV} = \sqrt{11 + \frac{1}{3}} = 3.367
\]
QUESTION 4 [20 points, divided as indicated]:

Dewey Cheatham, financial analyst for Dogbert's Diversified Dartboards, is trying to forecast stock market performance for Sirius Cybernetics Corporation (SCC), the nation's leading manufacturer of Solar Powered Flashlights. He figures that there's a 30% chance that the U.S. economy will be in growth phase in the coming year, and anticipates a 50% return on SCC's stock under that scenario. Stagnant growth (50% chance) means a 10% return on SCC stock, while recession (20% chance) indicates a 70% loss in SCC stock value.

a) [4] Set up a table giving the outcomes, and probabilities, for the anticipated return on SCC stock.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>+50%</td>
</tr>
<tr>
<td>Stagnant</td>
<td>+10%</td>
</tr>
<tr>
<td>Recession</td>
<td>-70%</td>
</tr>
</tbody>
</table>

b) [8] Based upon your table in Part A, find the expected value of the stock return.

\[
\text{Exp Val} = (50)(0.3) + (10)(0.5) + (-70)(0.2)
\]

\[
= 15 + 5 - 14
\]

\[
= \boxed{6\%}
\]

c) [8] Based upon your work above, find the expected variance of the stock return.

\[
\text{Var} = (50 - 6)^2(0.3) + (10 - 6)^2(0.5) + (-70 - 6)^2(0.2)
\]

\[
= \boxed{580.8 + 8 + 1155.2}
\]

\[
= \boxed{1744}
\]

\[
\text{Var} = \left( (50)^2(0.3) + (10)^2(0.5) + (-70)^2(0.2) \right) - \left( 6 \right)^2
\]

\[
= 750 + 50 + 980 - 36
\]

\[
= \boxed{1744}
\]
**QUESTION 5** (24 points; 8 each part):

Daily stock market returns on the Boravian Stock Exchange are approximately normally distributed, with a mean of 0.2 percent and a standard deviation of 2.0 percent.

a) What percentage of the time are daily returns on the Boravian Stock Exchange positive (that is, 0.0 or greater)?

\[
Z = \frac{\text{obs} - \text{exp}}{\text{sd}} = \frac{0 - 0.2}{2} = 0.10
\]

\[ Z \text{ table } \]

\[ 0.5 + 0.0398 = 0.5398 \]

b) What are returns on the Boravian Stock Exchange, on the best 15% of the days?

\[ \frac{1.5 - 0.15}{0.5} = 0.28 \]

1.04 SD above mean

\[ \Rightarrow 0.2 + (1.04)(2) = 2.28 \text{ pc}^+ \]

\[ \overline{\text{or}} \]

\[ 1.04 = \frac{x - 0.2}{2} = 2.28 \text{ pc}^+ \]

c) What percentage of the time are daily returns on the Boravian Stock Exchange negative four percent or worse?

\[
-0.4 - 0.2 \]

\[ \frac{0.2}{2} = -2.1 \]

\[ \text{table} \]

\[ 0.5 - 0.4821 = 0.0179 \]
QUESTION 6 [8 points]:
Use a calculator built-in function or a spreadsheet to find the sample standard deviation of the following data:

\[
\begin{align*}
509.23 & \quad 42.42 & \quad 821.97 & \quad 1017.27 & \quad 381.24 & \quad 904.45 \\
617.89 & \quad 131.44 & \quad 329.86 & \quad 823.42 & \quad 419.11 & \quad 127.72
\end{align*}
\]

The sample standard deviation is: \(328.28\)

QUESTION 7 [14 points]:
The data below are starting salaries for a random sample of students graduating from Rabid Haberdasher University. (The last two figures are presumably for Statistics majors. ☞)

\[
\begin{align*}
24,200 & \quad 27,100 & \quad 28,400 & \quad 31,500 & \quad 36,500 \\
25,400 & \quad 27,300 & \quad 29,200 & \quad 33,000 & \quad 40,500 \\
26,200 & \quad 27,500 & \quad 29,500 & \quad 33,750 & \quad 42,000 \\
26,200 & \quad 27,800 & \quad 30,500 & \quad 34,250 & \quad 54,000 \\
26,800 & \quad 28,000 & \quad 31,250 & \quad 35,000 & \quad 60,000
\end{align*}
\]

Sketch a histogram of these data. Make sure axes are labeled appropriately. What does your graph tell you?

\[\text{DISTRIBUTION OF STARTING SALARIES, R.H.U. GRADS}\]

\[\text{NOTE: Any reasonable scale is OK.}\]
\[\text{NOTE: Points on the boundary go in the higher bin.}\]
\[\text{(last two categories are 55K to just under 60K, and 60K to just under 65K – the \$60K figure is in the highest bin.)}\]
\[\text{INTERP: Most folks start in the \$25K to \$35K range... but there are a couple of high outliers in the \$50-\$60K range.}\]